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94UM0165 Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) pp 3-5, 11-17, 19-28, 31-40, 46-50, c4.

[The following are translations of selected articles from a Special Edition of VOYENNYY VESTNIK [Military Herald], a monthly journal of the Ministry of Defense. Refer to the table of contents for a listing of any articles not translated.]

Reforms and Life

94UM0165A Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) pp 3-5

[Article by Lieutenant-General Yu. Krasnikov]

[Text] In connection with the end of the Soviet Union's existence, the destruction of its military-strategic space, the appearance of new sovereign states and armies, and the reduction of the armed forces of the Russian Federation, there is an urgent need to reform the engineer troops. The goal of such reforms is to create the most expedient organization and establishment both in peacetime and wartime; a substantial increase in the capabilities both of the engineer troops and combined-arms large units and units for carrying out engineer support missions and, above all, for field fortification activity and camouflage of troops and installations. The reforms will make it possible to provide the engineer troops with qualitatively new engineer munitions and equipment, including dual-purpose, with a simultaneous reduction in the nomenclatures of single-purpose models. And the most important thing is the advance engineer preparation of strategic areas and increasing the effectiveness of command and control systems of the engineer troops based on broad introduction of automated systems.

Today, large units, units, and institutions of the engineer troops of the armed forces of the Russian Federation are charged with complex and crucial tasks. Above all, these are:

- maintaining combat and mobilization readiness of engineer large units, military units, and institutions; participating in cleaning up after accidents, catastrophes, and natural disasters and assisting the population;
- clearing areas of explosive objects;
- protecting bridges and other water engineering structures from drifting ice and floods;
- and conducting defensive construction.

In wartime, the engineer troops carry out missions for ensuring the survivability and maneuver of troops in all stages of their combat activities. They pin down the maneuver of enemy troops and inflict losses on the enemy with engineer assets. The main missions:

- are engineer reconnaissance of the enemy, terrain, and installations;
- fortification of areas, lines, and positions occupied by troops and deployment areas of command posts;
- setting up and maintaining artificial obstacles, including those installed by remote minelaying; preparing and maintaining troop avenues of advance;
- equipping and maintaining crossings;
- obtaining and purifying water and setting up water-supply points;
- performing engineer measures for camouflaging troops; and others.

The main feature of the missions carried out by the engineer troops is the trend toward increasing the volume of work and complication of the conditions for carrying them out with a simultaneous reduction in the time periods. Here one cannot avoid changes in the organizational structure, development of military-technical policy, and determining the priority directions in the development of the theory and practice of engineer support.

As far as engineer munitions and equipment are concerned, they must correspond to the specific support missions inherent to each armed service (combat arm). The technical characteristics and properties of the combat equipment must be such that they make it possible to carry out any mission. In this regard, it calls for the development and series production of special engineer munitions and equipment intended only for the troops and dual-purpose engineer munitions and equipment (in the troops and the national economy); national economic assets taken for the troops for engineer support purposes.

One of the primary tasks is to achieve parity on the technical level with the engineer munitions and armament of NATO armies and superiority over them for the most important models by creating equipment on new physical principles. That is why the basic directions in the development of engineer reconnaissance equipment may become integrated multipurpose engineer reconnaissance equipment with automated information processing and transmission to automated command and control systems, which make it possible at various ranges to detect minefields and receive information about the terrain; creating engineer munitions with artificial intelligence components; and also developing remote minelaying engineer systems, including using rocket-propelled systems and airborne platforms.

This also includes the further development of means of camouflage of troops, armament, military equipment, and military installations from enemy ground, air, and space reconnaissance assets, integrated reconnaissance and strike systems and reconnaissance and fire systems; creating highly protected and robotized vehicles for laying troop movement routes in conditions of massive obstacles and destruction; performing work in areas of radioactive contamination of the terrain, including by the destruction of nuclear power plants; standardizing the bridge train equipment with the capability to set up bridge crossings and raft and ferry crossings on rivers having fast currents with a simultaneous increase in their traffic and load-carrying capacity.

Scientific research and experimental design work certainly will be conducted taking into account the creation of complexes (families) of vehicles on common base chassis, which will make it possible to standardize engineer munitions and equipment.

But, as we know, man runs the machines. Therefore, the following must be placed at the basis of operational training of engineer officers:

- improving their knowledge in the area of military art and military engineering;
- developing practical skills in planning and making sound decisions on engineer support of operations (combat) and communicating assignments to troops;
- organizing coordination and comprehensive support of subordinate troops when they are accomplishing assigned missions;
- arranging the work of bodies and control posts of the chief of the engineer troops (service) using modern equipment (automated command and control systems).

In the interests of reducing the decision-making time, as experience has shown, it is advisable to develop and introduce such methods which enable officers of the engineer troops to quickly conduct the necessary calculations and make sound decisions for organizing the execution of engineer support missions. It is to this end that the collective of authors under the direction of Lieutenant-General V. Vasilyev did a considerable amount of work, the results of which you will see in this issue of the journal.

TMK-3 Trenching Machine

94UM0165B Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 11

[Article by Colonel I. Zhurikhin and Major V. Karpov]

[Text] The TMK-3 trenching machine is designed to dig trenches in unfrozen and frozen ground in field fortification activities for troop positions. Its complement includes: A K-703MV (Kirovets) wheeled tractor, a non-bucket type rotary trenching device, and a turning bulldozer blade. Cutters with wear-resistant plates made of VK-15 alloy are installed on the bucket wheel. The bucket wheel unloads with the aid of two tray-type unloading devices on both sides of the trench being dug. The maximum dump of dirt from the center line of the trench is up to two meters. The equipment is controlled from the cab by means of a hydraulic drive. The GST-90 hydraulic transmission ensures an operating speed of 90 to 1600 meters/hour. The trenching device has a mechanical transmission with two operating speeds for the bucket wheel rotation.

Basic Specifications and Performance Characteristics of the TMK-3

Engine power, kW	246
Size of trench in unfrozen ground, meters:	
depth	1.1-1.5
width at bottom	0.6
width at top	1.1
Size of trench in frozen ground, meters:	
depth	1.1-1.5
width	0.6
Technical productivity:	
in unfrozen category II-III ground, m^3/hr	330-800
in frozen ground, m^3/hr	90-150
Maximum speed, km/hr	44
Weight, t	25.77
Dimensions, mm:	
length	9675
width	3370
height	4160
Crew size	2

UKFS General-Purpose Fortification Equipment

94UM0165C Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 12

[Article by Captain I. Kazakov]

[Text] The general-purpose fortification equipment is design to erect various types of fortifications for protection of personnel at troop positions in short periods of time.

The UKFS is used to erect the following: Light overhead trench covers for protection against shell fragments and recesses in emplacements for firing assault rifles, machineguns, grenade launchers, and antitank missile systems; shelters for protection against shell fragments in observation structures for the platoon (company) commander; covered slit trenches and dugout shelters.

The set includes six main and five supplemental components.

The components can be made from steel or duraluminum pipe 30 mm in diameter with a wall thickness of 3 mm in a regular machine shop without using any complicated production equipment.

The grid base covered with sacking, canvas, ground sheet fabric, reinforced polyethylene film, and so forth is used as the cover.

Structures from the UKFS are erected by the troops manually and do not require the use of means of mechanization. Compared to structures made of lumber, the labor-intensiveness of erecting them is 2-2.5 times less, and they can be erected on any category of soil.

Basic Specifications of UKFS

Number of standard size elements	11
Number of structures that can be assembled from them	10
Time to assemble one structure, minutes	15-30 with a 2-man crew
Transportability	in packing by types of structures on combat equipment (BMP, BTR, tank) and on motor transport of support subunits

'Lifter' Container-Type Modular Fortification Structure

94UM0165D Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 13

[Article by Major V. Vypiraylov]

[Text] The 'Lifter' container-type modular fortification structure is designed for the protection, work, and rest of personnel at command and control facilities.

It consists of a work area and an entrance made in the form of a framework with a protective airtight door, two entrance locks situated inside the framework of the structure, and a pre-lock attached to it on hinges. The 'Lifter' can be used in three positions: Buried, half-buried (with soil sprinkled on it), and on the surface.

The structure is equipped with heating, ventilation, and lighting equipment. The work area has equipment for personnel to work and rest.

Basic Specifications of 'Lifter' Container-Type Modular Fortification Structure

Dimensions, meters	6.0x3, 15x2.3
Usable area, square meters	14.0
Weight (with internal equipment), tonnes	6.0
Capacity	7 people
Transportability	on KAMAZ-53212 motor vehicle
Erection time, hours	1.5-2.0
Crew for erection	3 men with EOV-4421 excavator and KS-3572 vehicle-mounted crane
Number of times it can be used	20

Method for Calculating a Formation (Unit) Man-Made Obstacle System

94UM0174B Moscow VOYENNYY VESTNIK in Russian No 10, Oct 1993 Special Edition (signed to press 20 Aug 93) pp 14-17

[Article by Candidate of Military Sciences, Lecturer, Colonel I. Kozachok and Colonel A. Logachev]

[Text] This method is designed for a formation (unit) engineering services chief to conduct an expanded calculation of the manpower and equipment required to create a system of man-made obstacles when the decision has been made for engineer support of a battle.

The method permits him to determine the manpower and equipment requirements to create obstacles, to manufacture rubble, and to assess the effectiveness of the system of obstacles that has been created.

The following data may be required to conduct the calculations:

- the enemy disposition of forces in the zone of action;
- the formation (unit) combat formation and its composition;
- the length of the defensive frontage that is accessible for enemy troop operations on the axes—on the enemy's main axis of attack [napravleniye glavnogo udara] (MAA) and on the other axis of attack [napravleniye drugogo udara] (OAA);
- the required density of the obstacles;
- the availability of time, manpower and equipment to create the obstacle system.

Table 1. The Required Quantity of Landmines and Demolition Materials To Create a Formation Man-Made Obstacle System

Axis	During Preparation of a Defense	During the Course of a Battle	Total
Main axis of attack (MAA)	TM-62 [antitank mines] - 12,000	TM-62 -2,880	TM-62 - 14,880
	PMN [antipersonnel fragmentation mines] - 4000		PMN - 4,000
	OZM-72 [antipersonnel fragmentation mines] - 160		OZM-72 - 160
	MON-90 [antipersonnel mines with directional fragmentation] -80		MON-90 - 80
	TM-83 [antitank mines] - 32	TM-83 - 19	TM-83 - 51
	PTrM [antitank mines] - 16		PTrM - 16
	VV [explosives] - 4 tonnes	explosives - 2.88 tonnes	explosives 6.88 tonnes
Other axis of attack (OAA)	TM-62 [antitank mines] - 9,000	TM-62 -2,520	TM-62 - 11,520
	PMN [antipersonnel fragmentation mines] - 2,400	TM-83 - 16	PMN - 2,400
	OZM-72 [antipersonnel fragmentation mines] - 120	VV - 2.52 tonnes	OZM-72 -120
	MON-90 [antipersonnel mines with directional fragmentation] -60		MON-90 - 60
	TM-83 [antitank mines] - 24		TM-83 - 40
	PTrM [antitank mines] - 12		PTrM - 12
	Explosives—2.4 tonnes		explosives 4.92 tonnes

2.1. Determination of the Required Quantity of Landmines and Demolition Materials To Install the Obstacles

The quantity of landmines and demolition materials required to create the system of man-made obstacles while preparing the defense is determined based upon the known density of the obstacles and the length of the defensive frontage that is accessible for enemy troop operations and in accordance with Table 2-1. The calculations are conducted first for the main axis of attack and then for the other axis. The results are summarized in the table below.

Table 2.1. The Quantity of Landmines and Demolition Materials on Tactical Obstacles During Preparations for Battle (km) and the Quantity of Landmines and Demolition Materials (in thousands)

Required Density of Obstacles on the Axis	Landmines and Demolition Materials	Length of Defensive Frontage That Is Accessible for Enemy Troop Operations on the Axis, km					
		8	12	16	20	24	30
0..	TM-62 [antitank mines]	0.6	0.9	1.2	1.5	1.8	2.25
	PMN-2 [antipersonnel fragmentation mines]	0.2	0.24	0.4	0.5	0.6	0.75
	OZM-72 [antipersonnel fragmentation mines]	0.008	0.012	0.016	0.2	0.024	0.003
	MON-90 [antipersonnel mines with directional fragmentation]	0.004	0.006	0.008	0.01	0.012	0.015
	TM-83 [antitank mines]	0.0016	0.0024	0.0032	0.004	0.0048	0.006
	PTrM [antitank mines]	0.0008	0.0012	0.0016	0.002	0.0024	0.003
	Explosives, tonnes	0.2	0.24	0.4	0.5	0.6	0.75
0.3	TM-62	1.8	2.7	3.6	4.5	5.4	6.75
	PMN-2	0.6	0.72	1.2	1.5	1.8	2.25
	OZM-72	0.024	0.036	0.048	0.6	0.072	0.009
	MON-90	0.012	0.018	0.024	0.03	0.036	0.045
	TM-83	0.0048	0.0072	0.0096	0.012	0.0144	0.018
	PTrM	0.0024	0.0036	0.0048	0.006	0.0072	0.009
	Explosives, tonnes	0.6	0.72	1.2	1.5	1.8	2.25
0.5	TM-62	3.0	4.5	6.0	7.5	9.0	11.25
	PMN-2	1.0	1.2	2.0	2.5	3.0	3.75
	OZM-72	0.04	0.06	0.08	0.1	0.12	0.15
	MON-90	0.02	0.03	0.04	0.05	0.06	0.075
	TM-83	0.008	0.012	0.016	0.02	0.024	0.03
	PTrM	0.004	0.0	0.008	0.01	0.012	0.015
	Explosives, tonnes	1.0	1.206	2.0	2.5	3.0	3.75
0.7	TM-62	4.2	6.3	8.4	10.5	12.6	15.75
	PMN-2	1.4	1.68	2.8	3.5	4.2	5.25
	OZM-72	0.056	0.084	0.112	1.4	0.168	0.021
	MON-90	0.028	0.042	0.056	0.07	0.084	0.105
	TM-83	0.0112	0.0168	0.0224	0.028	0.0336	0.042
	PTrM	0.0056	0.0084	0.0112	0.014	0.0168	0.021
	Explosives, tonnes	1.4	1.68	2.8	3.5	4.2	5.25
1.0	TM-62	6.0	9.0	12.0	15.0	18.0	22.5
	PMN-2	2.0	2.4	4.0	5.0	6.0	7.5
	OZM-72	0.08	0.12	0.16	0.2	0.24	0.3

Table 2.1. The Quantity of Landmines and Demolition Materials on Tactical Obstacles During Preparations for Battle (km) and the Quantity of Landmines and Demolition Materials (in thousands) (Continued)

Required Density of Obstacles on the Axis	Landmines and Demolition Materials	Length of Defensive Frontage That Is Accessible for Enemy Troop Operations on the Axis, km					
		8	12	16	20	24	30
	MON-90	0.04	0.06	0.08	0.1	0.12	0.15
	TM-83	0.016	0.024	0.032	0.04	0.048	0.06
	PTrM	0.008	0.012	0.016	0.02	0.024	0.03
	Explosives, tonnes	2.0	2.4	4.0	5.0	6.0	7.5
1.2	TM-62	7.2	10.8	14.4	18.0	21.6	27.0
	PMN-2	2.4	2.88	4.8	6.0	7.2	9.0
	OZM-72	0.096	0.144	0.192	0.24	0.288	0.036
	MON-90	0.048	0.072	0.096	0.12	0.144	0.18
	TM-83	0.0192	0.0288	0.0384	0.048	0.0576	0.072
	PTrM	0.0096	0.0144	0.0192	0.024	0.0288	0.036
	Explosives, tonnes	2.4	2.88	4.8	6.0	7.2	9.0
1.5	TM-62	9.0	13.5	18.0	22.5	27.0	33.75
	PMN-2	3.0	3.6	6.0	7.5	9.0	11.25
	OZM-72	0.12	0.18	0.24	0.3	0.36	0.45
	MON-90	0.06	0.09	0.12	0.15	0.18	0.225
	TM-83	0.024	0.036	0.048	0.06	0.072	0.09
	PTrM	0.012	0.018	0.024	0.03	0.036	0.045
	Explosives, tonnes	3.0	3.6	6.0	7.5	9.0	11.25
1.7	TM-62	10.2	15.3	20.4	25.5	30.6	38.25
	PMN-2	3.4	4.08	6.8	8.5	10.2	12.75
	OZM-72	0.136	0.204	0.272	0.34	0.408	0.051
	MON-90	0.068	0.102	0.136	0.17	0.204	0.255
	TM-83	0.0272	0.0408	0.0544	0.068	0.0816	0.102
	PTrM	0.0136	0.0204	0.0272	0.034	0.0408	0.051
	Explosives, tonnes	3.4	4.08	6.8	8.5	10.2	12.75
2.0	TM-62	12.0	18.0	24.0	30.0	36.0	45.0
	PMN-2	4.0	4.8	8.0	10.0	12.0	15.0
	OZM-72	0.16	0.24	0.32	0.4	0.48	0.6
	MON-90	0.08	0.12	0.16	0.2	0.24	0.3
	TM-83	0.032	0.048	0.064	0.08	0.096	0.12
	PTrM	0.016	0.024	0.032	0.02	0.048	0.06
	Explosives, tonnes	4.0	4.8	8.0	10.0	12.0	15.0

For less precise calculations, you can determine the required quantity of landmines and demolition materials not by axes but by the total width of the front of likely armor approach terrain along the formation's entire defensive zone.

The required quantity of landmines and demolition materials that are installed during the course of the battle is determined according to that same initial data in accordance with Table 2.2.

Table 2.2. The Quantity of Landmines and Demolition Materials in Tactical Obstacles During Preparations for Battle

Required Density of Obstacles on the Axis	Landmines and Demolition Materials	Length of Defensive Frontage That Is Accessible for Enemy Troop Operations on the Axis (km) and the Quantity of Landmines and Demolition Materials (in thousands)					
		8	12	16	20	24	30
0.1	TM-62 [antitank mines]	0.24	0.36	0.48	0.6	0.72	0.9
	TM-83 [antitank mines]	0.0016	0.0024	0.0032	0.004	0.0048	0.006
	Explosives, tonnes	0.24	0.36	0.48	0.6	0.72	0.9
0.3	TM-62	0.72	1.08	1.44	1.8	2.16	2.7
	TM-83	0.0048	0.0078	0.0096	0.012	0.0144	0.018
	Explosives, tonnes	0.72	1.08	1.44	1.8	2.16	2.7
0.5	TM-62	1.2	1.8	2.4	3.0	3.6	4.5
	TM-83	0.008	0.012	0.016	0.02	0.024	0.03
	Explosives, tonnes	1.2	1.8	2.4	3.0	3.6	4.5
0.7	TM-62	1.68	2.52	3.36	4.2	5.04	6.3
	TM-83	0.0112	0.0168	0.0224	0.028	0.0336	0.042
	Explosives, tonnes	1.68	2.52	3.36	4.2	5.04	6.3
1.0	TM-62	2.4	3.6	4.8	6.0	7.2	9.0
	TM-83	0.016	0.024	0.032	0.04	0.048	0.06
	Explosives, tonnes	2.4	3.6	4.8	6.0	7.2	9.0
1.2	TM-62	2.88	4.32	5.76	7.2	8.64	10.8
	TM-83	0.0192	0.0288	0.0384	0.048	0.0576	0.072
	Explosives, tonnes	2.88	4.32	5.76	7.2	8.64	10.8
1.4	TM-62	3.36	5.04	6.72	8.4	10.08	12.6
	TM-83	0.0224	0.0336	0.0448	0.056	0.0672	0.084
	Explosives, tonnes	3.36	5.04	6.72	8.4	10.08	12.6
1.5	TM-62	3.6	5.4	7.2	9.0	10.8	13.5
	TM-83	0.024	0.036	0.048	0.06	0.072	0.09
	Explosives, tonnes	3.6	5.4	7.2	9.0	10.8	13.5

Summing up the quantity of munitions required to install obstacles while preparing the defense and during the course of a battle provides the desired value—the required quantity of landmines and demolition materials to create a system of man-made obstacles.

The recommendations set forth in Table 2-3 need to be utilized in calculations in those cases when the required density of the obstacles on the axes has not been specified.

Table 2.3. Recommended Densities of Tactical Obstacles

	Unit	Formation
During preparations for battle	1.0-1.4	1.5-2.0
During the course of a battle	0.3-0.4	1.1-1.2

Comment: The first number is for the main axis of attack (MAA); the second number is for the other axis of attack (OAA).

The number of engineer subunits needed to reinforce the formation during preparations for (during the course of) a battle is determined from the expression:

$Dengrco^{rf} = (D^{MAA} \times La^{MAA} + D^{OAA} \times La^{OAA}/Cengrco \times Tco) - Nengrco$, (1)

where: D^{MAA}, D^{OAA}—is the required density of the minefields being installed on the main and other axis of enemy attack;
La^{MAA} La^{OAA}—the length of defensive frontage that is accessible for enemy troop operations on the main and other axis of enemy attack, respectively, in kilometers;

Cengrco—the calculated capabilities of an engineer company to install minefields (3 km per day—when preparing the defense when not in contact with the enemy, 1.5 km per day under conditions of direct contact with the enemy, 3.2 km per day during the course of a battle); Tco—the time allotted for the creation of obstacles while preparing the defense, in days (during the course of a battle Tco = 1 day); and, $Nengrco^{f}$—the number of calculated engineer companies in a formation (unit), Table 2.4.

Table 2.4. Number of Calculated Engineer Companies in a Formation (Unit)—Number of Engineer Companies

Unit, formation	While Preparing a Defense		During the Course of a Battle
	Not in Contact With the Enemy	Under Conditions of Direct Contact With the Enemy	
Unit	0.8	0.3	0.8
Formation	4.5	2.0	6.0

2.2. Assessment of the Effectiveness of Obstacles

The assessment of the effectiveness of obstacles is conducted according to two criteria: Losses of enemy tanks and BMP's [armored personnel vehicles] in the obstacles and the rate of advance reduction ratio.

Losses of tanks and BMP's are determined according to the formula:

$N^{T} = (D^{MAA} \times La^{MAA} + D^{OAA} \times La^{OAA}) \times N$, (2)

where: N—is the enemy tank and BMP loss standard per 1 kilometer of obstacles, in units per kilometer (this is accepted as being equal to 0.75/1 km).

The enemy rate of advance reduction ratio is determined according to the axes from the expression:

$Rarr^{MAA}(Rarr^{OAA}) = 1 + 1.5D \times V/L$, (3)

where: V - is the prescribed enemy advance rate (it is advisable to utilize 3 kph in the calculations); and, L—is the depth of the formation's (unit's) defense, in kilometers.

An example of the calculation of a formation man-made obstacle system that was prepared when not in contact with the enemy.

Initial data:

During preparations of the defense (not in contact with the enemy):

$D^{MAA} = 2.0$, $D^{OAA} = 1.0$,
$L^{MAA} = 8$ km, $D^{OAA} = 12$ km,
Tco = 2 days, $L^{def} = 30$ km.

During the course of a battle: $D^{MAA} = 1.2$, $D^{OAA} = 0.7$.

$D^{MAA} = 1.2$, $D^{OAA} = 0.7$.

Solution:

1. The quantity of landmines and demolition materials required to create a system of man-made obstacles while preparing the defense is determined according to Table 2.1, initially on the main axis of attack and then on the other axis. The results are noted in Table 1.

2. The number of engineer subunits required to reinforce a formation during preparation for the defense is determined from the expression (1):

$Dengrco^{rf} = (2.0 \times 8 + 1.0 \times 12)/(3.0 \times 2) - 4.5 = 0.1$

3. The number of engineer subunits required to reinforce a formation during the course of a battle is determined in a similar manner:

$Dengrco^{rf} = (1.2 \times 8 + 0.7 \times 12)/(3.0 \times 2) - 3.2 = 0.2$.

Because the results are close to zero in both cases, reinforcement of a division with engineer subunits is not required.

4. Tank and BMP losses are determined using the formula (2):

$N^{T} = [(2.0 + 1.2) \times 8] - [(1.0 - 0.7) \times 12] \times 0.75 = 34$.

5. The enemy advance rate reduction ratio is determined from the expression:

$Rarr^{MAA} = 1 + 1.5 \times (2.0 + 1.2) \times 3.0/30 = 1.48$.
$(Rarr^{OAA}) = 1 + 1.5 \times (1.2 + 0.7) \times 3.0/30 = 1.29$.

KFZ-1 High-Explosive Shaped Charge

94UM0165E Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) pp 19-20

[Article by Major A. Yakubchik]

[Text] The KFZ-1 high-explosive shaped charge is designed for accelerated demolition of roads, airfield runways, and emplaced objects, and working frozen ground by the explosive method.

Composition of KFZ-1

Stowage box—launching equipment	1
ID-120 rocket motor	1
Z-23 high-explosive charge	1
VZ-ZOM firing mechanism	1
KZ-5 shaped charge	1
Accessories	1 set

The KFZ-1 charge is assembled and set up at the place of use by a two-man crew. The charge is actuated electronically using a communication control line 100 meters long. The electric pulse transmitted over the control line actuates the pyrotechnic cartridge of the rocket motor. The rocket motor is started from the pyrotechnic cartridge. After the motor achieves the required reaction force, the KZ-5 shaped charge is detonated. The shaped-charge jet of molten material thus formed creates a borehole in the ground, which the high-explosive charge enters under the action of the motor's reaction force. The high-explosive charge detonates at a depth of 1.5-2 meters and leads to the destruction of the buried object and formation of a crater.

Depending on the task to be carried out, the KFZ-1 charge can be used alone or as part of a group of charges. The number of charges in the group is limited only by the capabilities of the current source.

Basic Specifications	
Weight of charge in stowage box, kg	76
Dimensions of charge in stowage box:	
length, mm	1560
width, mm	382
height, mm	335
Thickness of seasonally frozen ground that can be broken up, meters	up to 2
Destruction of objects installed in the ground, depth in meters	up to 3.5
Size of crater formed:	
diameter, meters	5-7
depth, meters	1.5-1.8
Preparation time, minutes	5
Method of actuation	electrical
Crew size	2
Temperature range of usage, degrees C	-40 to +50
Guaranteed shelf life, years	10

BUM Impact Drilling Machine

94UM0165F Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 21

[Article by Engineer V. Konyakhin]

[Text] The machine is designed for drilling boreholes in rock and wells in frozen and unfrozen ground when doing engineer work.

It consists of a KamAZ-4310 base chassis and operating equipment, which includes a distribution box with an oil pump and compressor, a traversing platform on which rifle equipment is installed, and the drilling mechanism with the working instrument.

The machine used the design of a modern impact-rotary method of breaking up rock. The impact frequency is 83-94 Hz.

The impact drilling machine can be successfully used in fortification of troop positions by the explosive method in conditions of frozen ground and in rock.

Basic Specifications of the BUM	
Engine power, kW	154
Parameters of borehole drilling:	
diameter, mm	70 and 46
depth, m	2.8
drilling speed, m/min	0.4-1.1
Parameters of well drilling:	
diameter, mm	300 and 150
depth, m	9.0 and 4
drilling speed, m/min	0.5-1.5
Maximum travel speed, km/hr	85
Weight, t	15.4
Dimensions:	
length, mm	7540
width, mm	2550
height, mm	3390
Crew size	3

Method of Calculating Forces and Assets for Crossing Enemy Obstacles

94UM0165G Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) pp 22-25

[Article by Colonel V. Sanko, candidate of military sciences and docent, and Colonel (Res) A. Shakin, doctor of technical sciences and docent]

[Text] The methods are intended for operational calculation of the volumes of obstacles in a large unit's zone of advance, the required number of lanes, and the necessary amount of forces to cross them.

To make the calculations, the chief of the engineer service will require the following initial data:

—the enemy grouping in the zone of advance;
—the battle formation of the large unit (unit) of our troops;
—the offensive front;
—the length of armor terrain;
—the available forces and assets for clearing lanes in obstacles.

3.1. Determining the Volumes of Obstacles and Rubble Placed by the Enemy in the Zone of Advance

The opposing enemy grouping is determined in percentages of a division and is adjusted using the coefficient of accounting of the enemy (Table 3.1). Depending on the reinforcement of the enemy division with engineer units, the volumes of obstacles in the zone of advance are determined according to Table 3.2.

The distribution of obstacles by lines is determined by multiplying the obtained values by the coefficient of obstacle distribution (Table 3.3).

Formula 3.1. is used to determine the density of minefields (conventional and remotely installed) being erected by the enemy to the depth of defense of the first-echelon division depending on the day the engagement is conducted (Table 3.4).

$D^{mnfldavr}=(L^{mfld}+0.5xL^{rmfld})\ xK^{cap}/L^{acc}$. (3.1)

The density of the minefields on the lines of the enemy defense is determined by formula 3.1 by multiplying by the corresponding coefficient of distribution of obstacles by lines (Table 3.3).

$D^{i}=(L^{mfld}xK_{i}^{mfld}+0.5x\ L^{rmfld}xK_{i}^{rmfld})xK^{cap}/\ L^{acc}$. (3.2)

In expressions 3.1 and 3.2:

L^{mfld} and L^{rmfld} are the length of conventional and remotely installed minefields, respectively, in km;

K^{cap} is the coefficient of the decrease in enemy capabilities for erecting obstacles depending on the day the engagement is conducted;

K_{i}^{mfld} and K_{i}^{rmfld} are the coefficients of distribution of obstacles by lines;

L^{acc} is the length of the zone of advance accessible for troop operations.

3.2. Determining the Required Number of Lanes in the Minefields

Depending on the density of the obstacles erected by the enemy and the battle formation used by the large unit, tables 3.5 and 3.6 are used to determine the required number of lanes in minefields in front of the forward edge and in the depth of the enemy defense.

3.3. Determining the Required Amount of Forces for Clearing Lanes in Minefields and Rubble

The number of combat engineer platoons (mineclearing platoon) necessary for clearing lanes in minefields in front of the forward edge of the defense and in the depth of the enemy defense is determined from the calculation that one platoon simultaneously makes 2-3 lanes and 6-8 lanes in a day.

The number of combat engineer platoons (mineclearing platoons, obstacle-clearing platoons) for assignment to the obstacle-clearing team (obstacle-clearing detachment) is determined according to the number of battalions (regiments) in the first echelon at the rate of up to a platoon for one obstacle-clearing team and one to two platoons for one obstacle-clearing detachment.

Assessing the Effectiveness of Crossing Obstacles

To assess the effectiveness of crossing obstacles, it is necessary to determine the coefficient of supply with engineer subunits, equal to the ratio of the number of available platoons (N^{av}) to the required number (N^{req}.

$K^{supp}=N^{av}/N^{req}$. (3.3)

Table 3.7. is used to determine the coefficient of the decrease in the rate of advance, the relative losses of armored equipment on the obstacles, and the time for accomplishing the day's mission.

Attachment: Tables for Calculation of Overcoming Obstacles

Table 3.1. Coefficient of Accounting of the Enemy

Strong Enemy	Weak Enemy
1.0-1.2	0.4-0.6

Table 3.2. Volumes of Minefields and Rubble Erected by the Enemy in the Zone of Advance

Proportion of enemy division forward of the offensive front of our troops	Length of conventional minefields			Minefields laid by remote means, mines/km	Number of destroyed bridges			Length of destroyed sections of roads, km		
	laid by division forces, km	reinforcement of division by one engineer battalion, km	reinforcement of division by two engineer battalions, km		laid by division forces, km	reinforcement of division by one engineer battalion, km	reinforcement of division by two engineer battalions, km	laid by division forces, km	reinforcement of division by one engineer battalion, km	reinforcement of division by two engineer battalions, km
0.1	7	9	13	4/3	1	1	2	0.2	0.5	0.8
0.2	13	19	26	8/7	1	2	3	0.4	1.0	1.5
0.3	19	29	40	11/10	2	3	4	0.6	1.5	2.3
0.4	26	37	53	15/14	2	4	6	0.8	2.0	3.1
0.5	33	17	66	19/18	3	5	7	1.0	2.5	3.9
0.6	39	56	79	23/22	3	6	8	1.3	2.9	4.6
0.7	46	66	92	27/25	4	7	10	1.5	3.4	5.4
0.8	52	73	105	30/29	4	8	11	1.7	3.9	6.2
0.9	59	85	118	34/32	5	9	13	1.9	4.4	6.9
1.0	65	94	132	38/36	5	10	14	2.1	4.9	7.7

Table 3.3. Coefficient of Distribution of Obstacles by Lines

Areas, Lines	Conventional Minefields	Remotely Laid Minefields	Demolitions
Staging area		0.05-0.10	
Moving up routes		0.10-0.15	
Forward edge of enemy defense	0.15-0.20	0.30-0.40	0.10-0.15
Depth of first-echelon brigades	0.4-0.45	0.15-0.20	0.40-0.45
Depth of defense of second-echelon units	0.35-0.40	0.10-0.15	0.35-0.40

Table 3.4. Coefficient of Decrease in Enemy Capabilities for Erecting Obstacles Depending on Day of Conducting Engagement

Days of Operations	Conventional Minefields	Remotely Laid Minefields	Demolitions
Day 1	0.8-0.9	0.8-0.9	0.9-1.0
Day 2	0.7-0.8	0.7-0.8	0.8-0.9
Day 3	0.7-0.8	0.7-0.8	0.8-0.9
Day 4	0.6-0.7	0.6-0.7	0.7-0.8

Table 3.5. Required Number of Lanes in Enemy Minefields in Front of Forward Edge of Defense

Density of Enemy Minefields	Number of companies in first-echelon large unit					
	12	18	24	30	36	42
0.1	2	2	3	3	4	5
0.2	3	4	5	6	8	9
0.3	4	6	8	9	11	13
0.4	5	8	10	12	15	17
0.5	6	9	12	15	18	21
0.6	8	11	15	18	22	26
0.7	9	13	17	21	26	30
0.8	10	15	19	24	29	34
0.9	11	17	22	27	31	38
1.0	12	18	24	30	36	42

Table 3.6. Required Number of Lanes in Enemy Minefields in Depth of Defense

Density of Enemy Minefield	Number of Companies in Large Unit's First Echelon							
	4	6	8	10	12	14	18	24
0.5	2	3	4	5	6	7	9	12
0.6	3	4	5	6	8	9	11	15
0.8	4	5	7	8	10	12	15	20
1.0	4	6	8	10	12	14	18	24
1.2	5	8	10	12	15	17	22	29
1.4	6	9	12	14	17	20	26	34
1.6	7	10	13	16	20	23	29	39
1.8	8	11	16	18	22	26	33	44
2.0	8	12	16	20	24	28	36	48
2.5	10	15	20	25	28	36	45	60
3.0	12	18	24	30	36	42	54	72
3.5	14	21	28	35	42	49	63	84
4.0	16	24	32	40	48	56	72	96

Table 3.7. Indicators of Effectiveness of Crossing Obstacles

Effectiveness Indicator	Coefficient of Supply with Subunits			
	0.25	0.50	0.75	1.00
Coefficient of decrease in rate of advance	0.60	0.70	0.75	0.85
Losses of tanks and BMP's on enemy obstacles, percent	7	5.5	4.5	4.2
Time to carry out day's mission	17	14	13	12

IMR-2M Obstacle-Clearing Engineer Vehicle

94UM0165H Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 26

[Article by Lieutenant-Colonel N. Babin]

[Text] The obstacle-clearing engineer vehicle is designed for supporting troops' advance through areas of destruction, including on terrain with radioactive and chemical contamination. They are successfully used in civil defense formations to clean up after massive destruction and large industrial accidents.

The vehicle consists of the following: A tank base chassis, a telescoping boom with a universal scoop-type operating element, a universal bulldozer attachment, and a track-clearing mine sweeper. Its operating equipment makes it possible to clear cross-country routes on moderately rough terrain, in light forests, and on virgin snow; dig up roots, knock down trees, and clear away tree blowdowns, rock barriers, and industrial rubble.

Basic Specifications of IMR-2M	
Engine power, kW	618
Maximum speed of travel, km/hr	60
Productivity:	
when laying cross-country routes	2-12
when doing excavating work, m^3/hr	up to 400
when clearing passages in tree blowdowns and rock barriers, m/hr	300-400
Boom capacity, t	2
Weight, t	42.6
Dimensions in the transport configuration:	
length, mm	9440
width, mm	3370
height, mm	3660
Crew size	2

UR-77 Mineclearing Vehicle

94UM0165I Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 27

[Article by Major N. Kutsenko]

[Text] The UR-77 mineclearing vehicle is designed for clearing lanes in minefields by the explosive method during the course of troop combat operations.

It consists of the base vehicle (2S1) with launching equipment and a basic load of two mineclearing charges. The mineclearing charges are housed in a dispenser in the vehicle and are fed to the minefield through the air using rocket motors.

The launching equipment with the load of charges and the rocket motors are located in a protected armored case.

The UR-77 is used as part of a combat engineer squad to clear lanes during preparatory fire for an assault on the forward edge of the defense, when advancing deep in the enemy defense, and on the opposite bank of a water obstacle.

The charges are launched onto the minefield and detonated by the vehicle commander-operator without leaving the vehicle. In doing so, the vehicle can be on land or afloat.

The mineclearing vehicle has high maneuverability and is air-transportable.

Basic Specifications of the UR-77	
Type of charges used	UZP-77, UZ-67
Length of charge, meters	93
Length of charge feed, meters:	
UZP-77	200 and 500
UZ-67	200 and 350
Size of lane in antitank minefield, meters:	
width	up to 6
length (UZ-67)	75-80
length (UZP-77)	80-90
Lane clearing time, minutes	3-5
Crew size	2 (commander-operator, driver-mechanic)
Travel speed, km/hr:	
over highways	up to 60
over broken terrain	up to 30
afloat	up to 5

UR-83P Mineclearing Unit

94UM0165J Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 28

[Article by Colonels A. Averchenko and S. Savitskiy]

[Text] The UR-83P portable mineclearing unit is designed for clearing lanes in minefields by the explosive method during the course of combat operations.

It consists of a guide, base, anchoring device, two dispensers, and a spare parts, tools, and accessories kit. It is equipped with one UZP-83 mineclearing linear charge. The mineclearing charge is contained in two sectional dispensers on the ground and feed to the minefield through the air by rocket motors.

The UR-83P is used as part of a combat engineer squad.

The charge is launched to the minefield by the squad commander from a shelter no closer than 50 meters from the mineclearing unit.

The charge it detonated remotely by a mechanical-action fuze.

The design of the mineclearing unit permits its use from amphibious warfare ships when landing amphibious assault forces, from assault river-crossing equipment when crossing water obstacles, and also from a truck or trailer bed.

Basic Specifications of UR-83P

Type of mineclearing charges used	UZP-77
Length of charge, meters	114
Distance of charge feed (according to head section of charge), meters	440
Size of lane in antitank minefield, meters:	
length	115
width	up to 6
Time for assembling and arming unit with UZP-83 charge by forces of combat engineer squad, minutes	90
Transportability	UR-83P with UZP-83 charge set is transported on ZIL-131 vehicle

UDM Universal Heavy Construction Vehicle

94UM0165K Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 31

[Article by Major V. Afanasyev]

[Text] The UDM universal heavy construction vehicle is designed for preparing and maintaining troop movement routes. Its operating equipment includes a loader or double-jaw fork and a swinging dozer blade.

When preparing troop movement routes, the vehicle performs the following types of work: Working and moving soil; making crossings over ditches, craters, and ravines; laying cross-country routes on terrain with low forest growth, brush, and rocks; laying cross-country routes over unpacked snow and clearing snow off roads; erecting crossing ramps; digging ditches; and loading bulk materials.

When equipping the UDM with a double-jaw device, it becomes possible to perform additional work such as clearing obstructions, piling and stacking lengthy objects (logs, pipe, and so forth), and loading lengthy objects and rubble into transport vehicles.

Basic Specifications

Base	K-702MV UDM wheeled tractor
Engine power, kW	246
Productivity:	
laying cross-country route	
over semibroken terrain, km/hr	up to 2
over unpacked snow up to 1.0 meter deep, km/hr	up to 4
filling in holes and craters, m^3/hr	125
digging ditches, m^3/hr	90
loading bulk material into transport vehicles, m^3/hr	120
Maximum travel speed, km/hr	44
Weight, tonnes	21.2
Dimensions, mm:	
length	10,150
width	3,360
height	3,735
Crew size	2

ADZM Air-Transportable Earth-Moving Machine

94UM0165L Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 32

[Article by Lieutenant-Colonel Yu. Baran]

[Text] The air-transportable ADZM earth-moving machine is designed for preparing routes for troop movement and maneuver and also for mechanizing earth-moving operations. Engineer subunits of mobile forces are equipped with it.

The machine consists of the following: Base chassis, universal bulldozer equipment, excavation equipment, hydraulic drive for operating equipment, and a set of engineer equipment and supplies (motorized drill, heat drill, explosive charges).

The machine's design, the composition of its operating equipment, and the set of engineer equipment and

supplies make it possible to dig ditches and trenches in category I-IV soil, lay cross-country routes in brush and over unpacked snow, and clear lanes in roadblocks of rock or rubble.

The ADZM can be transported in the cargo compartments of IL-76 aircraft, MI-26 helicopters, and also suspended externally from these helicopters.

Basic Specifications of the ADZM	
Productivity:	
filling in craters and ditches, m^3/hr	80-90
digging ditches:	
with excavator equipment, m^3/hr	30-40
with bulldozer equipment, m^3/hr	50-70
digging trench 1.5 meters deep, m^3/hr	25-35
preparing movement routes, km/hr	6-7
clearing snow from roads, km/hr	3-4
Shovel capacity, m^3	0.25
Weight, tonnes	13.4
Crew size	2

Methods of Calculating Crossing of Water Obstacles in Battle

94UM0165M Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) pp 33-38

[Article by Lieutenant-Colonel A. Kolesnichenko, candidate of military sciences and senior scientific associate, and Col G. Panyushkin, candidate of military sciences]

[Text]

One Must Remember!

Successful crossing of a water obstacle is possible if:

1. Crossing of the first echelon on a wide front at the required times is ensured.
2. Bridge crossings are prepared by no later than H-hour+2.*
3. Crossings are prepared in a timely manner on routes of movement and maneuver of troops with crossing capacities corresponding to crossing capacities of troop routes.
4. Repeated duplication of crossings is accomplished.
5. Reserve of crossing forces and assets is allocated.
6. Measures for camouflage and concealment of crossings are conducted.
7. Maneuver by crossing forces and assets is prepared.

The first two points pertain only to a forced crossing of a water obstacle during the course of a counteroffensive (offensive) engagement.

*On wide and large water obstacles, ferry (assault-ferry) crossings with traffic capacities ensuring crossing within the prescribed times may be set up instead of bridge crossings.

The methods are intended for consolidated calculation of crossing several water obstacles in fighting and in dislocation of troops.

The make it possible to determine the time for crossing troops over a water obstacle, the time for constructing low-level bridges and piling lines, and calculate the maneuver of crossing forces and assets along the front (at one water obstacle) and from one water obstacle to another.

A particular feature of these methods is the fact that they make it possible to conduct the calculation without using formulas, graphs, or nomographs based on predeveloped tables contained in the attachment.

The chief of the engineer service may require the following data to conduct the calculations:

- what the battle formation of the large unit (unit) will be before each water obstacle;
- the average rate of advance or required times for crossing of the large unit (unit);
- the characteristics of water obstacles on forced crossing sectors and at spots where routes intersect a water obstacle;
- the distance of crossings from line of contact of the sides at the staging area;
- the types, number, characteristics, and locations of existing crossings;
- the types, number, characteristics, and locations of crossings provided by the senior commander and also the times for crossing them;
- the supply of bridge structures by the start of executing the mission and the possible pace of their preparation or the available amount of lumber;
- the forces and assets allocated for preparing and maintaining the crossings.

Before the chief of the engineer service begins the calculation, he must take into account the recommendations which if carried out will make it possible to ensure crossing of the water obstacles by the troops.

5.1. Methods of Consolidated Calculation of Crossing Water Obstacles in an Counteroffensive (Offensive) Engagement

The calculation should be made in the following sequence.

5.1.1. Make the calculation of crossing the first water obstacle from the forward edge of the defense. To do this, determine:

- the time required for crossing first- and second-echelon subunits (Table 5.1);
- the forces and assets that can be used on a water obstacle, including taking into account a maneuver from other areas (from other water obstacles):
- the forces and assets that must be distributed to prepare and maintain crossings at the water obstacle and in reserve;

- the time for constructing low-level bridges and piling lines (tables 5.2 and 5.3).

In fact, after accomplishing this point, complexes of crossings will be formed at forced crossing sectors and at places where the routes intersect water obstacles. (A complex of crossings includes the primary and several alternate crossing.) The must be plotted on a work map.

Next, based on the availability of forces and assets, the situation at hand, and the time of completing construction of low-level bridges, determine the method of crossing troops (assault-ferry-bridge or assault-ferry).

To do this, one must know the estimated time for crossing first- and second-echelon units (tables 5.4 and 5.5). The same tables can also be used to calculate the crossing of first- and second-echelon large units having a battle formation depth of 15-18 km. In this case, the crossing time obtained using the table must be increased 2-2.5-fold.

If the time obtained is greater than the required time and the coefficient of mission performance is less than 0.8 (coefficient of mission performance is defined as the ratio of the required crossing time to the estimated time) or concentration of efforts is necessary on the axis of the main thrust, redistribute forces and assets (taking into account the possible maneuver of them along the front) (Table 5.6). Again, determine the estimated time for crossing first-echelon large units (units). The recalculation is accomplished until the coefficient of mission performance reaches 0.8-1.0.

After this condition has been fulfilled and the bridge crossings have been prepared in a timely manner (at least two or three for an army or corps; at least one for a division, brigade, or regiment), further calculation of crossing a water obstacle may not have to be done—a formation, large unit, or unit may execute the crossing at the required times.

5.1.2. Determine the time of free the crossing forces and assets at the first obstacle.

If the time obtained is greater than the required time and the coefficient of mission performance is less than 0.6 (coefficient of mission performance is defined as the ratio of the time required for crossing to the estimated time) or it is necessary to concentrate efforts on the axis of the main thrust, redistribute the forces and assets taking into account the possible maneuver of them along the front (Table 5.6).

5.1.3. Determine the time of freeing the crossing forces and assets, making it possible to execute a maneuver to the next water obstacle (Table 5.7).

5.1.4. Make a calculation of crossing subsequent water obstacles (done similarly to the estimate of crossing the first water obstacle) taking into account the maneuver of crossing forces and assets from the previous water obstacle.

5.1.5. Allocate forces and assets for preparing and maintaining crossings on routes lateral to the front.

The effect of crossing conditions differing from normal (summer, daylight, lack of causes complicating the crossing) is taken into account by the coefficients of conditions, the values of which are given in Table 5.8.

5.2. Methods of Consolidated Calculation of Crossing Water Obstacles in a Defensive Engagement

It is recommended to perform the calculation in the following sequence.

5.2.1. Determine the necessary system of crossings with reference to the hydrographic network in the defensive area and the planned network of routes.

Determine the necessary degree of duplication of each crossing in the defensive area. In doing so, it is recommended to accomplish the following: On the main movement and maneuver routes, at least a two-fold duplication; on routes of advance to the line for executing a counterattack, duplication is at the rate of one alternate crossing for two primary crossings. Duplication may not have to be done on withdrawal routes from the defensive area.

5.2.2. Make a calculation of crossing each water obstacle. To do this, determine:

- the required capacities of crossings in accordance with the capacities of the routes (roughly 200-250 units/hr for a large unit and 100-200 units/hr for a unit);
- the crossing forces and assets, and distribute them for preparing and maintaining complexes at the intersection of routes with the water obstacle and to the reserve;
- the time for constructing low-level bridges and piling lines (tables 5.2 and 5.3);
- the traffic capacities of crossings being prepared (Table 5.9), compare them with the required capacities, and if necessary redistribute forces and assets taking into account the possibility of a maneuver from other areas (Table 5.6).

5.2.3. If necessary, make a calculation of the maneuver of crossing forces and assets to another water obstacle (Table 5.7).

5.2.4. Make a calculation of crossing the next water obstacles (done similarly to the estimate of crossing the first water obstacle).

5.3. Methods of Consolidated Calculation of Crossing Water Obstacles During Displacement of Troops

The calculation should be performed in the following sequence.

5.3.1. Make the calculation of crossing the first of the planned water obstacles. To do this, determine:

- the required traffic capacities of the crossings in accordance with the traffic capacities of the routes (roughly 200-250 units/hr for a large unit and 100-200 units/hr for a unit);

- the crossing forces, and distribute them for preparing and maintaining crossing complexes at the intersection of routes with the water obstacle in question and to the reserve (the crossing complex includes a primary and several alternate crossings);
- the time for constructing low-level bridges and piling lines (tables 5.2 and 5.3);
- the traffic capacities of the crossings being prepared (Table 5.9), compare them with the required capacities, and (if necessary) redistribute the forces and assets taking into account the possibility of a maneuver from other areas (Table 5.6).

5.3.2. If necessary, make a calculation of the maneuver of crossing forces and assets to the next water obstacle (Table 5.7) and use the column "Time Executing Maneuver").

5.3.3. Make a calculation of the crossing of subsequent water obstacles (done similarly to the calculation of the crossing of the first water obstacle, taking into account the possible maneuver of crossing forces and assets from one water obstacle to another).

5.3.4. Allocate forces and assets for preparing and maintaining crossings on routes lateral to the front.

Attachment: Table for Calculating Crossing of Water Obstacles

Table 5.1. Required Time for Crossing of Troops

Subunit	On Counteroffensive (Offensive)						During Displacement		
	Rate of Advance, km/hr						Number of Routes		
	1.0	1.5	2.0	2.5	3.0	4.0	1	2	3
First-echelon unit or forward detachment	9	7	6	5	4	3			
Second-echelon unit							2	1	0.7
Large unit (depth of battle formation 15 km)	15	10	7	6	5	4	4	2	1.5
Large unit (depth of battle formation 25 km)	25	17	13	10	8	6	10	5	3.5

Table 5.2. Estimated Time of Constructing Low-Level Bridge (with availability of at least 80 percent of required number of bridge structures)

Width of Water Obstacle, meters	25	50	75	100	150	200	300	400	500	600
Forces, Assets	Duration of Construction, hrs									
engineer platoon-1	4	8	12	15	18	28	40	52	66	78
engineer platoon-2	4	5	5	8	9	14	20	26	33	39
engineer platoon-3	4	4	5	5	7	9	13	18	22	26
engineer platoon-4	4	4	5	5	6	7	10	13	16	20

Notes: 1. Length of bridge is taken as 10 meters greater than width of water obstacle when water obstacle width is under 50 meters and as 20 meters greater when width is 50 meters or more.

2. Time of construction of piling lines is equivalent to the time of constructing bridges.

Table 5.3. Estimated Time of Constructing Low-Level Bridge (with preparation of more than 20 percent of the required number of bridge structures)

Number of bridge structures to be prepared, meters	25	50	75	100	150	200	300	400	500	600
Assets	Duration of Construction, hrs									
LRV-1	23	41	58	75	110	144	213	282	351	420
LRV-2	15	23	32	41	58	75	110	144	179	213
LRV-3	12	18	23	29	41	52	75	98	121	144
LRV-4	10	15	19	23	32	41	58	75	92	110
LRV-5	9	12	15	18	23	29	40	52	64	75

Notes: 1. Bridge structures are prepared in the form of decking units.

2. It is taken into account that delivery of the bridge structures by the last trip will take 4 hours.

3. The time for constructing the piling lines is equal to the time for constructing the bridges.

LRV—high-capacity gangsaw

Table 5.4 (part one) Length of Time of Crossing a Unit by the Assault-Ferry Method

Width, m		50				100				200			
Current, m/s		0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0
Forces, Assets		Duration of Crossing, hrs											
rcap-1	mru	7.7	8.9	18	23	7.7	9.8	20	26	9.0	12	23	31
	tu	7.5	8.7	12	15	9.0	9.6	13	17	10	11	16	21
rcap-2	mru	6.5	8.6	19	23	7.0	9.4	21	28	8.1	11	24	29
	tu	6.0	6.9	10	13	6.9	8.0	14	17	8.0	9.0	13	19
pp-1	mru	6.5	7.4	14	17	6.2	7.9	15	19	6.9	8.9	17	21
	tu	6.1	6.8	9.0	12	6.9	7.4	9.8	13	7.8	8.4	11	15
pp-1, rcap-1	mru	5.8	7.4	14	17	6.2	7.9	15	19	6.9	8.9	17	21
	tu	5.5	6.8	9.0	12	6.9	7.4	9.8	13	7.8	8.4	11	15
pp-2	mru	5.7	7.2	13	16	6.0	7.5	14	17	6.8	8.6	16	20
	tu	5.3	6.4	8.5	11	6.5	7.0	9.4	12	7.5	8.0	10	14
pp-2, rcap-1	mru	2.5	3.2	5.5	6.7	2.7	3.2	5.9	7.3	3.0	3.6	6.7	8.4
	tu	2.3	3.0	3.9	4.8	3.1	3.2	4.2	5.3	3.5	3.7	4.8	6.2
pp-2, rcap-2	mru	2.3	2.9	5.3	6.5	2.4	3.1	5.7	7.1	2.8	3.5	6.5	8.2
	tu	2.0	2.7	3.5	4.4	2.8	2.9	3.8	4.9	3.1	3.3	4.4	5.8
pp-3, rcap-1	mru	4.3	4.3	5.1	6.1	4.5	4.6	5.4	6.5	5.0	5.1	6.0	7.4
	tu	3.1	3.2	3.8	4.7	3.3	3.3	4.1	5.3	3.7	3.8	4.7	6.3
pp-4, rcap-1	mru	3.3	3.3	4.0	4.7	3.4	3.5	4.2	5.0	3.8	3.8	4.6	5.5
	tu	1.8	1.8	2.2	2.8	1.9	1.9	2.3	3.2	2.1	2.2	2.7	3.9

mru—motorized rifle unit; tu—tank unit; pp—pontoon platoon; rcap—rivercrossing assault platoon

Table 5.4 (part two) Length of Time of Crossing a Unit by the Assault-Ferry Method

Width, m		400				600			
Current, m/s		0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0
Forces, Assets		Duration of Crossing, hrs							
rcap-1	mru	12	15	30	42	14	17	38	53
	tu	14	15	20	28	17	18	25	35
rcap-2	mru	11	15	31	42	13	19	38	55
	tu	9.5	13	20	27	12	16	23	32
pp-1	mru	8.4	11	21	26	10	13	24	33
	tu	9.6	11	14	19	11	13	17	23
pp-1, rcap-1	mru	8.4	11	21	26	10	13	24	33
	tu	9.6	11	14	19	11	13	17	23
pp-2	mru	8.1	10	20	24	9.4	12	22	30
	tu	9.0	9.5	13	18	10	12	16	21
pp-2, rcap-1	mru	3.6	4.5	8.2	11	4.2	5.3	9.8	13
	tu	4.2	4.6	6.0	7.8	4.8	5.4	7.0	9.4
pp-2, rcap-2	mru	3.3	4.3	8.0	10	3.9	5.1	9.4	12
	tu	3.8	4.2	5.5	7.4	4.4	4.8	6.5	8.8
pp-3, rcap-1	mru	6.0	6.1	7.3	9.3	6.8	7.3	8.5	11
	tu	4.5	4.8	5.9	7.8	5.3	5.6	7.1	9.6
pp-4, rcap-1	mru	4.5	4.6	5.5	6.7	5.1	5.2	6.3	7.7
	tu	2.5	2.7	3.4	4.9	2.9	3.1	4.0	5.9

mru—motorized rifle unit; tu—tank unit; pp—pontoon platoon; rcap—rivercrossing assault platoon

Table 5.5 (part one) Length of Time of Crossing a Unit by the Assault-Ferry-Bridge Method

Width, m			50				100				200			
Current, m/s			0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0
Forces, Assets			Duration of Crossing, hrs											
rcap-1, bridge-1	m-u		1.2	1.3	1.7	1.7	1.2	1.3	1.8	1.8	1.3	1.5	1.9	1.9
	tu		1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.5
rcap-2, bridge-1	mru		1.1	1.2	1.6	1.6	1.1	1.2	1.7	1.7	1.2	1.4	1.8	1.8
	tu		1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.4
rcap-3, bridge-1	mru		1.0	1.1	1.4	1.4	1.0	1.1	1.5	1.5	1.1	1.2	1.6	1.7
	tu		1.0	1.0	1.1	1.1	1.0	1.1	1.1	1.2	1.2	1.2	1.3	1.3
pp-1, rcap-1, bridge-1	mru		1.0	1.2	1.6	1.6	1.1	1.2	1.6	1.7	1.2	1.3	1.8	1.8
	tu		1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.4
pp-1, rcap-2, bridge-1	mru		1.0	1.1	1.5	1.5	1.0	1.1	1.5	1.5	1.1	1.2	1.7	1.7
	tu		1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.2	1.3	1.3
pp-2, rcap-3, bridge-1	mru		0.9	1.0	1.3	1.3	0.9	1.0	1.3	1.4	0.9	1.1	1.5	1.5
	tu		0.9	0.9	1.0	1.0	0.9	1.0	1.1	1.1	1.0	1.1	1.1	1.2
pp-3, rcap-1, bridge-1	mru		1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.7	1.8
	tu		1.1	1.1	1.2	1.2	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4
pp-4, rcap-1, bridge-1	mru		1.2	1.2	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.3	1.4	1.5
	tu		0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.2
pp-4, rcap-2, bridge-1	mru		1.2	1.2	1.3	1.4	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.6
	tu		1.0	1.0	1.0	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.3
crossing over bridges	mru	1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.3	2.3	2.3	2.3
		2	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	tu	1	1.6	1.0	1.0	1.0	1.6	1.6	1.6	1.6	1.8	1.8	1.8	1.8
		2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9

mru—motorized rifle unit; tu—tank unit; pp—pontoon platoon; rcap—rivercrossing assault platoon

Table 5.5 (part two) Length of Time of Crossing a Unit by the Assault-Ferry-Bridge Method

Width, m			400				600			
Current, m/s			0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0
Forces, Assets			Duration of Crossing, hrs							
rcap-1, bridge-1		mru	1.8	2.0	2.7	2.8	2.4	2.8	3.9	3.9
		tu	1.9	2.0	2.0	2.1	2.7	2.8	3.0	3.0
rcap-2, bridge-1		mru	1.6	1.9	2.5	2.6	2.1	2.5	3.5	3.6
		tu	1.7	1.8	1.9	1.9	2.2	2.3	2.5	2.8
rcap-3, bridge-1		mru	1.4	1.6	2.2	2.3	1.8	2.2	3.0	3.1
		tu	1.5	1.6	1.7	1.8	1.9	2.0	2.3	2.4
pp-1, rcap-1, bridge-1		mru	1.6	1.8	2.5	2.5	2.2	2.4	3.3	3.5
		tu	1.7	1.8	1.8	2.0	2.3	2.4	2.5	2.6
pp-1, rcap-2, bridge-1		mru	1.4	1.6	2.2	2.3	1.8	2.2	3.0	3.1
		tu	1.5	1.6	1.7	1.8	2.1	2.0	2.3	2.4
pp-2, rcap-3, bridge-1		mru	1.2	1.4	2.0	2.1	1.6	1.8	2.6	2.9
		tu	1.4	1.4	1.5	1.6	1.6	1.8	2.1	2.2
pp-2, rcap-1, bridge-1		mru	2.1	2.1	2.2	2.4	2.7	2.7	3.0	3.2
		tu	1.6	1.6	1.8	1.8	2.2	2.2	2.4	2.7
pp-4, rcap-1, bridge-1		mru	1.7	1.7	1.8	2.1	2.1	2.3	2.4	2.7
		tu	1.3	1.4	1.4	1.6	1.7	1.7	2.0	2.2
pp-2, rcap-3, bridge-1		mru	1.8	1.8	2.0	2.1	2.4	2.4	2.6	2.9
		tu	1.4	1.5	1.5	1.7	1.8	1.8	2.1	2.3
crossing over bridges	mru	1	3.2	3.2	3.2	3.2	4.7	4.7	4.7	4.7
		2	1.6	1.6	1.6	1.6	2.4	2.4	2.4	2.4
	tu	1	2.4	2.4	2.4	2.4	3.5	3.5	3.5	3.5
		2	1.2	1.2	1.2	1.2	1.8	1.8	1.8	1.8

mru—motorized rifle unit; tu—tank unit; pp—pontoon platoon; rcap—rivercrossing assault platoon

Table 5.6. Calculating Maneuver by Crossing Forces Along Front

Distance between crossings by air, km	5	10	15	20	30	40	50	60	70	80	90	100	120	150
When Moving:	Duration of Maneuver, hrs													
over coastal route lateral to the front	4.5	5	6	6	7	8	9	10	11	12	13	14	16	18
over divisional route lateral to the front	6	6.5	7	7.5	8	8.5	9	10	10	11	12	13	14	16
over army route lateral to the front	10	11	11	12	12	13	14	15	15	16	16	17	19	22
over water ($V_{current}$=0.5 m/s)	2	2.5	3.5	4	5.5	7.0	8.0	9.0	10	12	13	15	17	20
over water ($V_{current}$=1.5 m/s)	2.5	3.5	4.5	5.0	5.5	7.0	9.0	11	15	17	19	21	24	28
by helicopter	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.0

Notes: 1. Maneuver time includes time for taking down the crossing.

2. Conclusion of the maneuver is concentration of subunit in the assembly area for equipment.

Table 5.7. Calculating Maneuver by Crossing Forces from One Water Obstacles to Another

Distance between water obstacles, km	10	20	30	20	30	40	60	20	30	40	60	40	60	80
Rate of advance, km/day	10	10	10	20	20	20	20	30	30	30	30	40	40	40
	Time of Operation of Troops in Area Between Water Obstacles (Astronomical), hrs													
	10	34	58	10	29	34	58	7	10	28	34	10	29	34
Units, Subunits	Time Executing Maneuver, hrs													
River-crossing assault	4	5	6	5	6	7	9	5	6	7	9	5	7	11
Pontoon-bridge	5	6	5	6	7	8	10	6	7	8	10	6	8	12
Engineer bridge-building	5	6	5	6	7	8	10	6	7	8	10	6	8	12

Note: Maneuver time includes time for taking down the crossing.

Table 5.8. Coefficients of Crossing Conditions

Crossing Conditions	Coefficient of Conditions
1. Drifting ice with density of 0.3-0.4	up to 1.5
2. Poor visibility (night, fog, smoke)	up to 1.3
3. Radioactive (chemical) contamination of banks (personnel work in protective gear)	up to 1.25

Table 5.9. Traffic Capacity of Crossing Sites

Types of Crossing	Width, m						
	50	100	200	300	400	500	600
	Traffic capacity of crossing sites, units/hr						
Floating bridge	304	296	267	228	190	157	129
Low-level bridge	283	205	183	154	127	103	84
Permanent oridge	263	378	330	270	216	171	135
Submerged bridge	341	302	292	277	264	252	242
Ford	100	96	90	81	72	59	45

PP-91 Bridge Train

94UM0165N Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 39

[Article by Colonels P. Khmelyuk and A. Malyshev, senior scientific associate]

[Text] The PP-91 bridge train is designed for erecting bridge and ferry crossings over water obstacles.

The set includes 32 river, 4 shore, and 8 motor sections, 4 towing launches, 4 flooring sections, and auxiliary equipment that can be transported on KrAZ-260G bridge-train motor vehicles and ZIL-4334 launch vehicles.

In the opened position, each river section is a finished section of floating bridge or ferry 7.2 meters long. To use the section after unloading it from the vehicle into the water, it is only necessary to close two deck and four bottom locking devices. The capacity of one river section is 22.5 tonnes.

A shore section is distinguished from a river section by the slope of the deck and by the stronger design of the pontoons. Floating bridges and ferries can be assembled from the river and shore sections by connecting them using the docking devices on transoms. The obliquely symmetrical position of these devices makes it possible to connect the river sections regardless of how the transoms are positioned relative to one another. Motor sections are arranged between the river sections. Each river section is equipped with anchor winches with anchors to secure the bridges in a current and ramps for making entrances to the ferries.

Floating bridges and ferries have high floodability, ensured by the large number of water-displacing sections, each of which consists of four pontoons divided into two watertight compartments. The good repairability of the sections makes it possible to restore them quickly in field conditions.

The PP-91 bridge train makes it possible to bring all troop equipment across virtually any water obstacle.

Based on its specifications, the bridge train has nothing similar to it in the world practice of bridge building.

It can be successfully used without design modifications in various sectors of the national economy, especially when building and restoring permanent bridges, when erecting temporary crossings in logging, in agricultural work, and also when cleaning up after natural disasters in areas of extensive flooding.

The PP-91 is delivered to consumers in various complete sets.

Basic Specifications of the PP-91

Floating bridges			
Carrying capacity, tonnes	60	90	120
Length from bridge train set, meters	268	185	141
Width of roadway, meters	6.55	10.11	13.77
Set up time, minutes	30	60	50
Ferries			
Carrying capacity, tonnes	90	180	360
Number of ferries from set	8	4	2
Travel speed, km/hr	14	12	12
Size of loading platform, meters	13.77x146.55x57.6		13.77x57.6
Assembly time, minutes	15	20	25

PTS-2 Amphibious Tracked Carrier

94UM0165O Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 40

[Article by V. Zhabrov, senior scientific associate]

[Text] The PTS-2 amphibious tracked carrier is designed for assault crossing of artillery systems; transport of wheeled and tracked artillery prime movers, armored personnel carriers, motor vehicles, various cargo, and personnel over water obstacles.

It has a crew cab with local armor plating, an air filtration plant, cargo platform, winch, equipment for digging in (which can be used for digging shelters and preparing slopes to the water), water pumping equipment (emergency and dehumidifying pumps), and maritime equipment supporting use of the carrier at wave action up to three points. The PTS-2 is also equipped with a roentgen meter (measures the dose rate of gamma radiation inside the cab), sanitation equipment, two-way external and internal communications equipment, standardized automatic firefighting system, and observation and orientation instruments.

The equipment to be carried across is loaded and unloaded on land over ramps through the folding tailboard. Self-propelled equipment is loaded (unloaded) under it own power; towed equipment is loaded using the winch.

A wheeled trailer can be used with the carrier for simultaneous crossing of a prime mover (on the carrier) and artillery system (on the trailer). It permits operation at an outside air temperature of up to +40 degrees and a current up to 2.5 meters/second. It can be transported by rail, sea, and air without dismantling the equipment.

Basic Specifications of the PTS-2

Full weight, tonnes	24.2
Crew size	2
Carrying capacity on land and water, tonnes	12
Size of cargo platform, mm:	
length (to rear wall of cab)	8,225
width	2,870
Dimensions, mm:	
length (in transport configuration)	11,990
width (at tracks)	3,300
height (at tent arc)	3,170
Engine:	
make	V-46-5
power, kW (hp)	522 (710)
Top speed, km/hr	
on land	60
on water (loaded)	11.7
Fuel range:	
on land (highway), km	500
on water, hrs	15
Winch pull, tonnes	10

OPS-5 Water Distillation Plant

94UM0165P Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 46

[Article by Lieutenant-Colonel A. Voskresenskiy]

[Text] The OPS-5 water distillation plant was accepted into troop supply in 1990 to replace the OPS plant and is designed to desalinate, neutralize, and purify water. Unlike thermocompression desalination of water, the OPS-5 uses the highly productive progressive method of membrane isolation of the media—reverse osmosis.

The technology of reverse osmosis desalination of water is noted for high reliability and simplicity of design, and makes it possible to decrease the size characteristics and power-intensity of the plant. Depending on the salt content of the source water and the depth of its demineralization, the OPS-5 plant provides for a stepped desalination, making it possible to do deep demineralization of water and obtain lightly mineralized water of up to 1-2 grams/liter.

The plant ensures complete purification of water by treating it with chlorine-containing preparations with subsequent dechlorination in a sorption filter.

The plant includes water purification and desalination equipment, a power-generating unit, a PLVS laboratory, RDV-5000 reservoirs, reagents, and a spare parts, tool, and accessories kit. All equipment in the OPS-5 plant is arranged on one KRAZ-260G base chassis. The power-generating unit is actuated from the vehicle's transfer gearbox.

The OPS-5 plant's output for desalination of water is twice as high as the OPS plant, and the power consumption has been cut 40 percent.

The OPS-5 plant can be used in areas experiencing a shortage of fresh water, on seagoing vessels, and also in emergencies and ecological catastrophes.

Basic Specifications of the OPS-5

Base	KRAZ-260G motor vehicle
Output for water with following salt content:	
2-6 g/l, cubic meters/hr	6-5
5-18 g/l, cubic meters/hr	5-3
18-35 g/l, cubic meters/hr	3-18
Set-up time until receipt of desalinated water, hrs	2
Shut-down time, hr	1
Fuel consumption, l/hr	22
Weight, t	21.6
Crew size	4

Method of Calculating Volume of Engineer Camouflage Measures

94UM0165Q Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) pp 47-49

[Article by Colonel A. Antonov, candidate of military sciences and docent, Colonel (Ret) I. Shapkin, candidate of technical sciences and docent, and Major V. Gladkov]

[Text] This method makes it possible to estimate the volume and effectiveness of camouflage measures.

Calculation of the labor intensity of engineer camouflage measures, taking into account the specific conditions and the tactical situation at hand, is done by the formula:

$W=W^{m}x(1-K^{ec})-W^{mc}$, (1)

where W^{m} is the labor input (volume) of camouflage measures, in man-hours;
K^{ec} is the extent natural camouflage is used for concealing objects;
W^{mc} is the volume of tasks carried out in the interests of the large unit (unit) by forces and assets of the senior chief, in man-hours.

The extent of natural camouflage is used for concealing objects is determined by assessing the concealing properties of the terrain of the corresponding area according to a topographical map and calculating by the formula:

$K^{ec}=N^{obc}xK^{cp}/N^{o6}$, (2)

where N^{obc} is the number of objects concealed by natural camouflage;
N^{o6} is the total number of objects in the large unit (unit);
K^{cp} is the indicator of the concealment properties of the natural camouflage (Table 7.1).

Table 7.1. Indicator of Concealment Properties of Natural Camouflage, K^{cp}

Type of Forest	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
Coniferous	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Deciduous	0.5	0.5	0.6	0.8	0.9	1.0	1.0	1.0	0.9	0.8	0.8	0.5
Mixed	0.75	0.75	0.9	0.9	0.95	1.0	1.0	1.0	0.95	0.9	0.9	0.75

The number of forces involved in carrying out the engineer camouflage and simulation measures is:

$N^f = W/T^{ct}$, (3)

where W is the labor intensity of the tasks to be performed, in man-hours;
T^{ct} is the time for performing the camouflage tasks, in hours.

After making the calculations, the chief of the engineer service of the large unit (unit) must assess the effectiveness of the planned camouflage measures.

The following are considered the basic criteria of effectiveness: Probability of detection of single and group objects; survivability of troops (objects).

A tank, infantry fighting vehicle [BMP], gun, and so forth are considered single objects.

One method of determining the quantitative probability of detection of single objects is according to a nomograph (Figure 7.1). The probability of detection of an object by aerial reconnaissance is determined depending on the type and conditions of conducting reconnaissance and the camouflage technique.

Example. *Determine the probability of detection of a tank in a pit camouflaged by local means on the terrain with a degree of cover of K^{ct}=15 percent (determined according to a map) by aerial and photo reconnaissance from medium altitude.*

The course of accomplishing the task is shown in the nomograph by a broken line. As a result, the probability of detection is P^o=0.65.

Group objects such as a subunit, unit, or large unit usually become the targets of reconnaissance and destruction.

For these objects, it is important to assess the effectiveness of engineer camouflage measures not only according to the probability of detection but also according to survivability.

According to the nomograph (Figure 7.2.), the probability of detection and the survivability of a group object over time are determined depending on the time of the year, degree of cover of the terrain, and the nature of measures conducted for camouflage and fortification.

Example. *A motorized rifle unit occupied an assembly area that was prepared with fortifications. It was summer. The degree of cover of the terrain was K^{ct}=20 percent. The equipment had been camouflaged with natural camouflage and standard screens; personnel were in dugout shelters.*

Determine the probability of detection (P^o) and survivability (q) of the unit 10 hours after occupying the area.

The course of solving the task is shown in the nomograph by the broken line. As a result, the probability of detection is P^o=0.56, and q=0.8.

After determining the method (technique) of camouflage and simulation, the chief of the engineer service makes the decision to involve units (subunits) to perform engineer camouflage and simulation measures. Subsequently, as part of the monitoring group he determines the completeness and quality of the tasks performed.

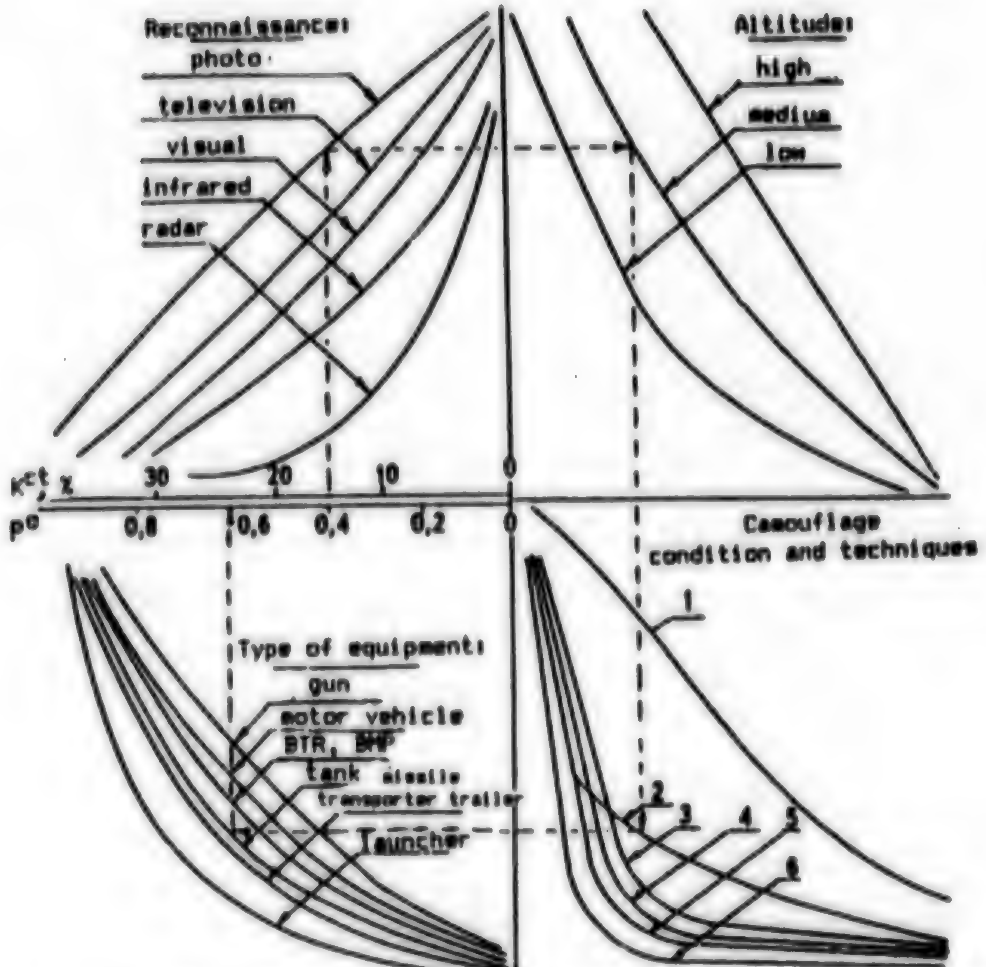

Figure 7.1. Nomograph for determining indicator of detection of combat and special equipment by aerial reconnaissance assets. Techniques of camouflaging equipment in areas and at positions: 1-in pits without camouflage; 2-in pits with camouflage with local means; 3-outside of pits without camouflage; 4-outside of pits with camouflage by T/O&E means; 5-in pits with camouflage by T/O&E means; 6-in pits with camouflage by T/O&E and local means

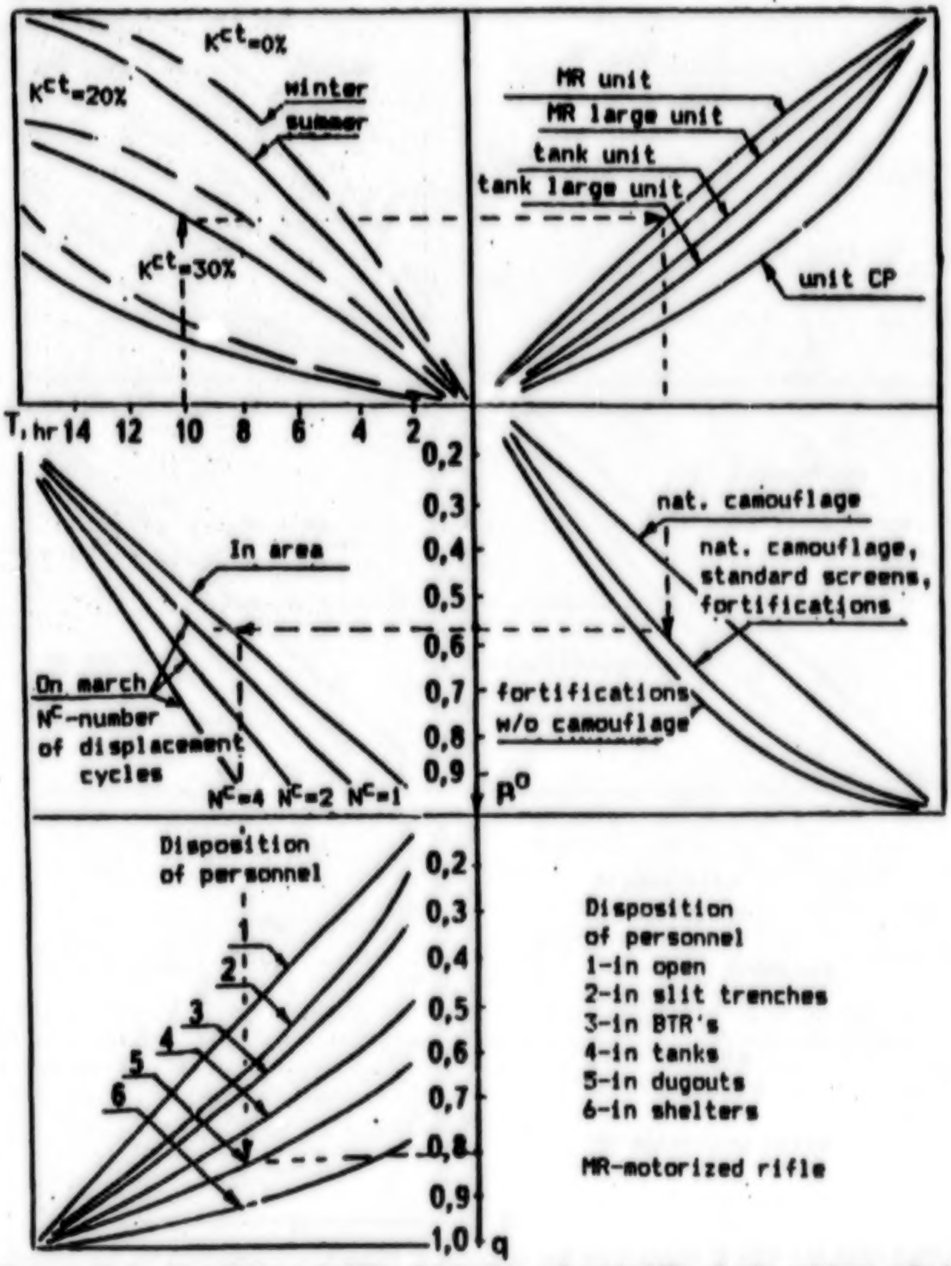

Figure 7.2. Nomograph for determining probability of detection and survivability of units and large units in disposition areas and on the march

KSZ Combat Engineer Protective Clothing Set

94UM0165R Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p 50

[Article by Colonel P. Olenin and Lieutenant-Colonel N. Salamakhin]

[Text] The protective clothing set is designed to protect the combat engineer from injury by the explosion of antipersonnel mines when conducting reconnaissance and clearing an area of landmines by hand.

The kit enables the combat engineer to search for and destroy (disarm) antipersonnel mines.

The KSZ includes a jacket with a cushioning climate layer, trousers, a hood, a visor, shoe covers, and a respirator.

The jacket, trousers, hood, and shoe covers are made of a large number of layers of ballistic fabric. A differentiated change in the protective properties of the clothing is ensured by using removable metal armor elements with varied levels of strength.

The protective clothing is recommended for use, depending on the conditions of the task being carried out, as a full set or without individual components, with additional reinforcement or without reinforcement. Three basic variants are formed: The base variant for protection against small fragments; a reinforced variant for protection against small fragments; and a bulletproof variant for protection against directional mines.

The design features of the clothing make it possible to be used in a temperature range of -35 to +35 degrees C and to fire small arms.

Basic Specifications of the Protective Clothing Set

Protective properties of the base variant:

—against explosion of high-explosive antipersonnel mines to a distance of 1 meter;

—against bullets from a Makarov pistol from a distance of 10 meters.

Protective properties of the base variant with additional armored protection:

—against explosion of POMZ-2 fragmentation-type antipersonnel mines at a distance of 2 meters;

—against explosion of MON-50 fragmentation-type antipersonnel mines at a distance of 15 meters;

—against bullets from Kalashnikov 7.62-mm and 5.45-mm assault rifles from a distance of 15 meters.

MDK-3 Excavating Machine

94UM0165S Moscow VOYENNYY VESTNIK in Russian No 10, Oct 93 Special Edition (signed to press 20 Aug 93) p c4

[Unattributed article]

[Text] The MDK-3 is designed for digging ditches for sheltering armament, equipment, and personnel when preparing positions for troops and command and control facilities.

Basic Characteristics	
Productivity, m^3/hr	up to 800
Size of ditches that can be dug:	
width, meters	3.7
depth, meters	up to 3.5
Base chassis	MT-T multipurpose combination prime mover-carrier
Fuel range, km	500
Machine preparation time, minutes	5
Full weight, tonnes	39.5
Dimensions in transport position, mm	10,220x3,730x4,040
Crew size	2
Operating equipment	dozer blade, ripper, road harrow
Communications equipment	R-124 intercom, R-123 radio set

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